

and Rolling Green, 1; Morris, 0.8; Farmington, 0.4; Medford, trace. *Montana*.—Fort Maginnis, 3.4; Fort Custer, 0.1; Helena and Virginia City, trace. *Nebraska*.—Alliance and Hay Springs, trace. *Nevada*.—Ruby Hill, 5; Austin, 3.2; Palisade, 0.5. *New Hampshire*.—West Milan, trace. *New Mexico*.—Chama, trace. *New York*.—Kendall, trace. *North Dakota*.—Fort Pembina, 3.4; Fort A. Lincoln, 3; Fort Buford, 2.6; Fort Totten, 2.2; Davenport and Grand Forks, 1.5; Fort Yates, 1.2; Bismarck, 0.5. *Ohio*.—Wauseon, 1.1; Bangorville, Canton, and Weymouth, trace. *South Dakota*.—Clark and Fort Meade, 4; Brookings, 3.5; Rapid City, 2.5; Wolsley, trace. *Wisconsin*.—Phillips, 3.2; Embarrass, 2.5; Neillsville, 1; Lincoln, 0.2; Delavan, Greenwood, and Milwaukee, trace. *Wyoming*.—Fort McKinney, 4; Owen, 3; Cheyenne, 1; Fort Bridger and Fort Washakie, trace.

No reports of snow on the ground at the close of the month have been received.

HAIL.

Description of the more severe hail storms of the month are given under the heading "Local storms." Hail was reported as follows: 1st, Ky., Md., N. J., Pa., Tenn., Tex. 2d, Colo., Pa., S. Dak., Tenn. 3d, Ind. T., Ky., La., Mich., N. Y., S. Dak., Tex. 4th, Ga., Kans., La., Minn., N. Mex., Tex., Va., Wyo. 5th, Ark., Colo., Iowa, La., Mich., Nebr., N. Y., Ohio, Oregon, S. Dak., Tex. 6th, Cal., Iowa, Ky., Mich., Minn., Mo., Nebr., Nev., Ohio, S. Dak., Tenn. 7th,

Ky., Mich., Nev., Ohio, Tenn., Va. 8th, Colo., Mo., Nebr., Va., Wyo. 9th, Colo., Iowa, Mo., Nebr., Nev., Tex., Wash., Wis. 10th, Cal., Ill., Ind., Mich., Nev., N. Mex., N. Y., Ohio, Tenn. 11th, Minn., Nebr., Tex., Wyo. 12th, Colo., Ill., Ind., Iowa, Minn., Miss., Mo., Nebr. 13th, N. Y., N. C., Pa., Tex., Va. 14th, Mass., N. J., Pa., S. C., Va. 15th, Mass., Nebr., S. C., Tex. 16th, Me., Mass., N. Mex., N. Y., Va., Wis. 17th, Kans., Nebr., N. H., N. Y., S. Dak. 18th, Colo., Fla., Ga., Ill., Ind., Iowa, Mo., Nebr., N. H., N. Y., S. Dak., Tex. 19th, N. C., Pa., S. C., Tenn., Tex., W. Va. 20th, Kans., S. Dak., Va. 21st, Nebr. 22d, Colo., Ill., Iowa, Kans., Mo., Nebr., N. Mex. 23d, Colo., Ill., Kans., La., Mo., Nebr., N. Mex., Ohio, Pa. 24th, Colo., Ill., Ind. T., Iowa, Mich., Minn., Ohio, Pa., S. Dak., Tex., Va. 25th, Ky., Md., Minn., N. Dak., Pa., S. Dak., Tex., Va., W. Va. 26th, Colo., Kans., Mich., Wis. 27th, Iowa, Minn., Nebr., Nev., N. Y., Utah. 28th, Colo., Conn., Mass., Minn., Nebr., Nev., N. H., R. I., Vt. 29th, Colo., Iowa, Nebr., N. Dak., Oregon, Wash., Wis. 30th, Ind., Iowa, Kans., Md., Mich., Mo., Nebr., Ohio, Oregon, Pa., Va., Wash., Wis. 31st, Ark., Cal., Mo., Mont., Oregon, Va., Wyo.

SLEET.

Sleet was reported as follows: 4th, Colo., Iowa, Minn. 5th, N. Y., S. Dak. 6th, Ill., Mich., S. Dak. 7th, Ohio, Tenn. 9th, S. Dak. 11th, Nev. 12th, Colo., S. Dak. 14th, Minn., Wis. 15th, S. Dak., Wis. 20th, Pa. 21st, S. Dak. 31st, Ohio.

WINDS.

The prevailing winds during May, 1890, are shown on chart ii by arrows flying with the wind. In New England, the south Atlantic states, the upper Mississippi valley, and on the southeastern slope of the Rocky Mountains the winds were mostly from south to southwest; in Florida and the east and west Gulf states, from south to east; in the middle Atlantic states and the Ohio Valley and Tennessee, from southeast to southwest; in the Rio Grande Valley, from the southeast; in the lower lake region, from west to southwest; in the extreme northwest, from north to northwest; on the northeastern slope of the Rocky Mountains, over the northern plateau region, and along the middle Pacific coast, from northwest to southwest; on the middle-eastern slope of the Rocky Mountains from north to east; over the southern plateau region from south to west; over the middle plateau region from north to west; on the north Pacific coast, variable in Washington, and from west to northwest in Oregon; along the south Pacific coast from west to northwest; and in the upper lake region and the Missouri Valley, variable.

HIGH WINDS (in miles per hour).

Wind velocities of fifty miles, or more, per hour were reported at regular stations of the Signal Service as follows: 2d, 50, n., at Huron, S. Dak. 3d, 52, nw., at Fort McKinney, Wyo. 8th, 50, sw., at Dodge City, Kans. 10th, 59, ne., at Chicago, Ill. 12th, 52, n., at Fort Sully, S. Dak. 20th, 51, sw., at Dodge City, Kans. 24th, 55, sw., at Chicago, Ill. 51, n., at San Antonio, Tex. 25th, 60, nw., at Bismarck, N. Dak.; 54, nw., at Corpus Christi, Tex. 27th, 54, n., at Fort McKinney, Wyo. 28th, 54, s., at Yankton, S. Dak.; 54, nw., at Fort Buford, N. Dak.; 50, sw., at Dodge City, Kans. 29th, 60, ne., at Nantucket, Mass.

LOCAL STORMS.

On the 1st a tornado, accompanied by rain and hail, passed southeastward over the northeastern part of McCulloch county, Texas, its path being about one hundred and fifty yards wide and several miles in length; the storm passed through an uninhabited part of the country, save where it struck and demolished a settlement of five houses, and levelled everything in its track. On the 3d a heavy storm caused a great amount of damage in De Soto county, Louisiana; a storm moving from

the northwest, and attended by thunder, heavy rain, and some hail, struck Mesquite, Tex., about noon; the storm was fearful in its intensity for about one-half hour, and a great many buildings were blown down or damaged; excessively heavy rain occurred in Alabama, Mississippi, and southern Illinois, and heavy rain on the south Atlantic coast. On the 4th a violent wind storm occurred in Hood and Parker counties, Texas, killing several persons, and heavy hail damaged crops in Breestone and Young counties, Texas. On the 5th hail of unusual size began falling at Roseburgh, Oregon, at 8.21 p. m., and continued to fall for nine minutes; the hailstones were from three-eighths to one-half inch in diameter and of a conical shape, some being more spherical than others, and some quite flattened; the hail storm was confined to the vicinity of Roseburgh and to the country lying north, northeast, and southeast of that city, and damaged young corn; a hail storm, moving east, passed over Camp Peña Colorado, Tex., accompanied by high wind, and lasted twenty-five minutes; hail fell to a depth of six inches, and some of the hailstones measured one and one-half inch in circumference; a heavy wind and rain storm occurred at Natchez, and a violent wind storm at Jackson, Miss.; heavy electrical and rain storms prevailed in New York, New Jersey, Massachusetts, and Connecticut. On the 6th heavy electrical and rain storms occurred in Pennsylvania, Maryland, and West Virginia; and terrific electrical, rain, and wind storms were reported as having prevailed in Iowa for four days. On the 9th heavy storms were reported in Iowa, northern Missouri, and in Wilson county, Kansas. On the 10th a tornado occurred at York, Ohio, at about 4 p. m., causing considerable damage to buildings, etc.; a tornado visited Archer township, Harrison county, in the afternoon, uprooting trees, etc.

A tornado occurred at Akron, Summit Co., Ohio, on the 10th, concerning which Prof. Edward W. Glaypole, of Buchtel College, Akron, Ohio, has made the following report: "A funnel-shaped cloud, moving toward northeast by east, or between that point and east-northeast, passed over Akron from 5.24 to 5.27 p. m. (local time), or 4.51 to 4.54 p. m. (central time), its track having an average width of about three hundred feet. The storm approached with thunder and lightning, but no flash was observed within a mile of where I stood. Heavy rain fell within

the range of the storm, about one hundred and fifty yards from the point of observation, and the rain was heavier during and after than before its passage; no hail fell. Quantities of timber and movable articles were carried up in the storm, and, although there is good testimony of a whirling motion, I was not close enough to clearly observe this motion. Timber on the north side of the track generally fell toward the south-east; in the track, toward northeast by east; and on the south side of the track, toward north-northeast; and, in rare cases, toward north by west. A far greater number of trees fell on the south side than on the north side of the centre of the storm's path, and their direction was often nearly due north. The storm appeared to divide toward the end of its path; one small part passing over or close by my house, and the other took the same course about one hundred and fifty yards farther on. A chimney on a house was blown down and a tree broken, while there was scarcely any wind where I stood, about one hundred and fifty feet farther on. A large piece of boarding, for bills, fully four hundred feet farther north from the line of the storm than my position, was thrown over and fell south. No persons were killed or seriously injured, and the damage to property approximated \$15,000. This storm, or another one, came down about four miles to the northeast by east and destroyed a barn, but beyond this no further sign was seen in or near this county."

A storm passed through Tipton county, Tennessee, beginning at 2.45 p. m.; great damage was done by wind and hail; the rainfall, exclusive of the hail, was 1.20 inch in thirty minutes; the general direction of the storm was a little south of east, and the direction of the wind whirl was contrary to the movement of the hands of a watch; a severe wind storm prevailed at Memphis, Tenn., in the evening, and considerable damage was done to property and shade trees, and several boats sustained injury; a destructive storm visited Venago county, Pennsylvania, destroying buildings, killing or injuring several persons, and washing out railroad tracks; a hail storm, moving northeast, and accompanied by thunder and lightning, began at Stockton, Cal., at 5.45 p. m., and continued about seven minutes; the hail-stones were about the size of small peas; hail also fell at Nicolaus and Sutter Creek, but no damage was done. On the 12th a heavy wind storm visited Terre Haute, Ind., causing considerable damage to buildings and trees; a severe thunder-storm began at Saint Louis, Mo., at 7.45 p. m., and the wind attained a velocity of sixty miles per hour, without causing material damage; a heavy rain storm, attended by high wind, occurred at Meridian, Miss., causing damage to bridges, etc., and a severe hail storm was reported four miles west of that place. On the 13th a cloud-burst was reported at Mammoth Springs, Ark. On the 15th a heavy rain storm swept over Camp Peña Colorado, Tex., on a path almost parallel with that followed by the storm of the 5th; the storm continued fifty-five minutes; a heavy wind storm, moving northeast, commenced at Wahpeton, N. Dak., at 6 p. m., and continued about ten minutes, causing destruction to property in that

section to the value of about \$2,500. On the 17th a thunder-storm, attended by rain and some hail, began at Leavenworth, Kans., at 9.17 p. m., and hail caused damage to fruit about four miles east of that place.

On the 18th a thunder-storm of unusual severity passed south-eastward over Saint Louis, Mo., and continued from 4 p. m. to 5.05 p. m.; large hail and heavy rain fell, the hail-stones covering the ground to a depth of one-half inch, and the precipitation for the sixty-five minutes was 2.28 inches, 2.23 inches of which fell in fifty minutes, and portions of the city were flooded to a depth of three feet; a destructive hail storm occurred at Fairbury, Nebr., destroying fruit, etc., within an area about one-half mile wide and three miles long; a severe storm passed over Wayne county, Ohio, between 3 p. m. and 4 p. m.; much damage was caused to buildings and trees by the wind, and many sheep were killed by hail; severe gales prevailed on Lakes Erie, Huron, and Michigan; crops were damaged near Dupont, Ga., by heavy hail. On the 20th houses were unroofed in Baltimore, Md., by wind, and in Frederick county, Maryland, hail injured fruit trees and crops; a severe rain storm occurred at Angelica, N. Y., during which a railroad bridge over the Genesee River was carried away, and other damage done by washouts. On the 22d a heavy thunder and rain storm occurred at Davenport, Iowa; a number of bridges over small streams were washed away, and railroads were damaged; heavy thunder-storms occurred at Logansport, Peru, and Marion, Ind., in the early morning; considerable damage was done near Peru by a cloud-burst, and houses were struck by lightning at Marion. On the 23d western Pennsylvania was visited by heavy rain, wind, and electrical storms, which caused considerable damage by flood, etc.; the northern counties of Kentucky and some of the more western counties of West Virginia were swept by heavy storms. On the 24th a tornado moving northeast passed southeast of Alma, Mich., at about 4 p. m., passing through the towns of Emerson and Wheeler, unroofing buildings and uprooting trees in a path about one-half mile wide; the storm was accompanied by thunder and lightning, and hail fell on its outer edges. On the 25th a heavy rain storm, accompanied by severe thunder and lightning, flooded streets and cellars and caused great damage at Johnstown, Pa.; heavy rain and electrical storms prevailed over Washington, Carroll, and Frederick counties, Maryland, at night. On the 29th a thunder-storm, accompanied by hail and heavy rain, began in the evening at La Crosse, Wis.; at about 3 a. m., 30th, hail-stones the size of walnuts fell, causing considerable damage to window glass; the storm was very destructive in Trempealeau county, and in the eastern part of Buffalo county, Wisconsin, where the rainfall was very heavy, carrying away dams and flooding streams. On the 30th a thunder-storm, with rain and hail, occurred at Blue Knob, Pa., commencing at 3.30 p. m.; hail the size of marbles fell to a depth of nearly one inch. On the 31st, at 12.40 p. m., a thunder-storm commenced at Parkersburgh, W. Va., moving from northeast of station towards the south; some of the hail-stones were one inch in diameter.

INLAND NAVIGATION.

FLOODS.

There was a general and marked fall in the lower Mississippi river and tributaries during the month, and much land in the river parishes of Louisiana which was inundated at the beginning of the month was being cultivated at its close. On the 1st the Mississippi River was 41.1 feet on the gauge at Helena, Ark., and 4.1 feet above the danger-line; 48.5 feet, and 7.5 foot above the danger-line at Vicksburg, Miss.; and 14.7 feet, and 1.7 foot above the danger-line at New Orleans, La. The Red River was 31.6 feet, and 2.6 feet above the danger-line at Shreveport, La., and the Arkansas River was 16.6 feet, and 0.6 foot above the danger-line at Fort Smith,

Ark., and 23.7 feet, and 0.7 foot above the danger-line at Little Rock, Ark. The Red River rose at Shreveport, La., until the 8th, when it stood at 34.6 feet on the gauge, and 5.6 feet above the danger-line. The country below Fulton, Ark., was flooded, and immense damage was caused to property and stock. The Pandora levee, about eight miles above Shreveport, La., broke at 9 p. m. of the 6th, and on the 7th the plantations across the river from Shreveport were flooded by backwater. After the 8th the Red River fell steadily at Shreveport, La., until the close of the month. The lower Mississippi river fell steadily throughout the month, save at Memphis, Tenn., where there was a slight rise until the 4th, and there was a marked rise in